Original Communication

Demographic and socioeconomic risk factors of adult violent victimization from an accident and emergency department and forensic medicine perspective: A register-based case-control study

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Abstract

Objectives: To describe demographic and socioeconomic risk factors of adult violent victimization leading to contact with an emergency department and/or an institute of forensic medicine based on a case-control study design.
Design: A register-based case-control study comparing demographic and socioeconomic characteristics of 10,799 adult victims of violence (cases) and 53,986 randomly selected population-based controls matched for age, gender, and date.
Data sources: Cases were included from a Danish emergency department and a Danish institute of forensic medicine. Demographic and socioeconomic data for cases and controls were extracted from two national longitudinal registers.
Statistics: Data were analysed using logistic regression in a semi-adjusted model adjusting for age, gender, and year, and a fully adjusted model including several variables.
Results: Factors positively associated with adult violent victimization were "being a pensioner" (OR: 4.71; 95% CI: 4.18–5.30), "being unemployed" (OR: 3.15; 95% CI: 2.85–3.48), and "not living with a partner" (OR: 2.93; 95% CI: 2.74–3.14), whereas the factors strongly negatively associated with adult violent victimization was "being a student" (OR: 0.72; 95% CI: 0.63–0.83). In the semi-adjusted analysis a foreign citizenship of a country outside Europe was significantly associated with adult violent victimization (OR: 1.79; 95% CI: 1.60–2.00), whereas in the fully adjusted analyses the association decreased to an insignificant level.
Conclusions: Our findings emphasize the multifaceted nature of injuries from violence. The findings from this study indicated potential risk factors, which should be specifically addressed when planning preventive strategies.
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Keywords: Violence; Socioeconomic factors; Risk factors; Unemployment; Adult

1. Introduction

The relation between interpersonal violence and demographic and socioeconomic factors is being increasingly recognised. Patient population studies based on unselected emergency department (ED) contacts have revealed that adult victims of violence are frequently males, living alone, poorly educated, unemployed, having a low income, and living in inadequate social conditions.[1–7]

A Scottish case-control study based on unselected ED victims revealed a significantly higher unemployment rate and deprivation score among victims than among

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controls.[8] Conversely, a similar British study showed no association between unemployment or socioeconomic status and violence.[9] US ED case-control studies have shown that poor education, high unemployment rate, low income, high rate of change in residence, social isolation, and receipt of government monetary assistance are related to an increased risk of violent victimization among females.[10–12] Another US case-control study found an association between high education or high income and female-to-female non-intimate partner violence.[10] However, the selection methods of controls and the small sample sizes make comprehensive analyses impossible and limit the conclusions which can be drawn from previous studies. No previous larger ED and/or Forensic Medicine based case control studies have described demographic and socioeconomic risk factors of adult violent victimization.

Therefore, this study aims at describing demographic and socioeconomic risk factors of adult violent victimization leading to contact with an ED and/or an Institute of Forensic Medicine based on a larger case-control study using population-based controls.

2. Methods

2.1. Study population

The population base for the present study was Odense Municipality in Denmark for the period 1991–2002. Included as cases were all victims of physical deliberate interpersonal violence aged 20 years or more who attended the ED at Odense University Hospital or who were subjected to medico legal autopsy at the Institute of Forensic Medicine (IFM), University of Southern Denmark. Physical deliberate interpersonal violence was defined according to the World Health Organisation.[13] Violent victimisation was defined as physical deliberate interpersonal violence
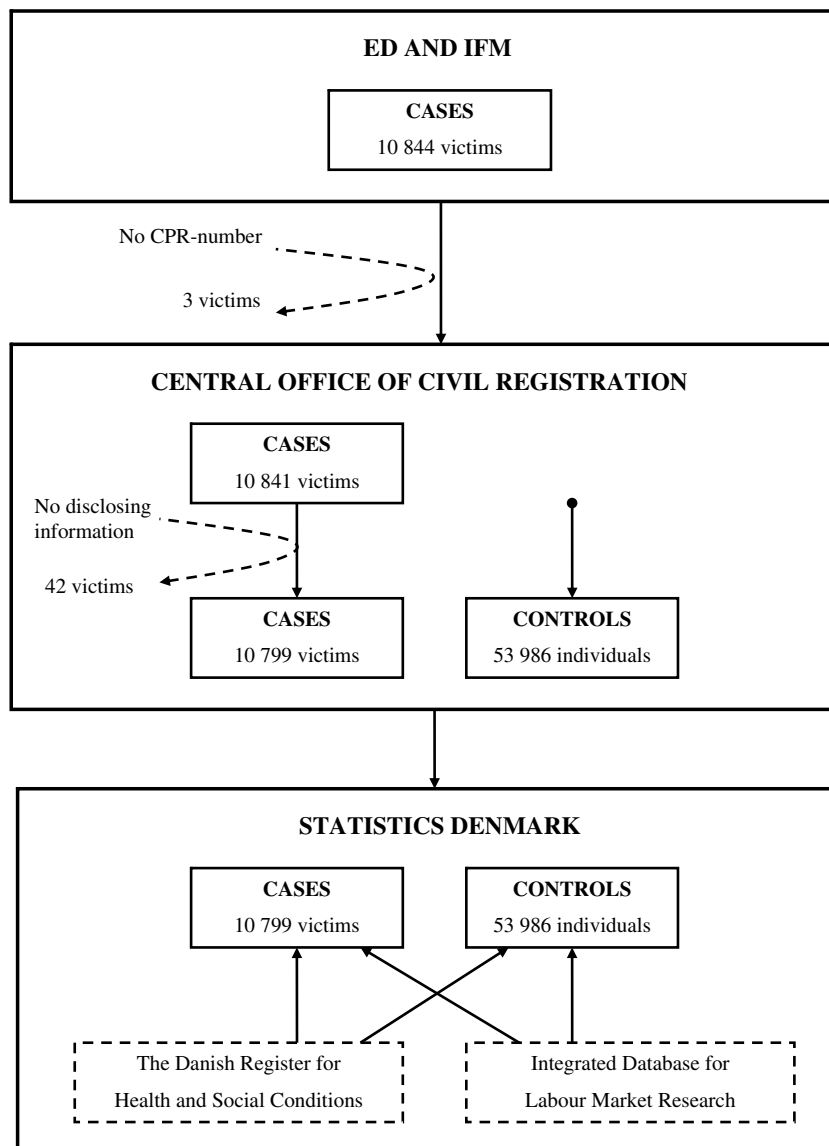

Fig. 1. Inclusion and exclusion of cases, selection of controls, and linkage to national registers.

leading to ED and/or IFM contact. Odense Municipality is a well-defined urban geographic area with a population of 186,000 inhabitants, mainly consisting of the City of Odense. Approximately, 140,000 inhabitants are 20 years or more. The municipality has only one ED located at Odense University Hospital, and one IFM located at the University of Southern Denmark. The IFM do approximately 200 post mortem examinations each year and less than four of these cases are related to deliberate interpersonal violence. From the routine patient registration system the cases for the study were included prospectively and consecutively as they presented in the ED for treatment. In case of more than one contact for the same incident by a person only the first contact was included. The cases from the IFM were identified by a complete review of all autopsy reports by the first author.

By using a case-control design based on frequency matching for age, gender, and date of violence five controls were randomly selected from the total population of Odense Municipality. The controls were extracted from the Danish Civil Registration System (CRS) by the Danish Central Office of Civil Registration. The CRS contains a unique 10-digit personal identifier (CPR-number) for all individuals.[14] The CPR-number, which follows each individual for his/her entire life, is used as a key to retrieve and merge individual data about cases and controls from different demographic and socioeconomic databases. We allowed each individual to be selected as a control for different cases more than once and we allowed cases to be selected as controls for other cases.

In the study period 10,844 victims of violence met the inclusion criteria (Fig. 1). Three victims were excluded due to lack of a CPR-number at the time of violence, being immigrants who had not yet been assigned a CPR-number. Another 42 victims were excluded because they had requested that the Danish Central Office of Civil Registration will not disclose any information for research purposes leaving 10,799 cases for the study.

Overall 53,986 controls were selected for the study. In five cases (0.1%) it was not possible to select five matched controls. The cases in question were 93 years or more with a very small number of matching controls in the background population.

2.2. Socioeconomic and demographic data sources

Demographic and socioeconomic data were extracted from the Danish Register for Health and Social Conditions and the Integrated Database for Labour Market Research (IDA).[15,16] The Danish Register for Health and Social Conditions contains longitudinal health, demographic, and socioeconomic data.[15] The IDA contains longitudinal information on labour market affiliation.[16] Additionally, for those cases and controls living in a relationship demographic and socioeconomic data concerning the partner were also extracted from the registers. The latest demographic and socioeconomic status before the incident of

violence or before selection as controls was extracted from the registers.

2.3. Variables and statistical methods

A conceptual framework was defined, and a step-by-step model for analyses of demographic and socioeconomic risk factors was made. Initially, a large number of variables were extracted for validation of content. Secondly, variables with large numbers of missing values, variables only partly covering the study period, and variables with inconsistent coding in the study period were excluded. Thirdly, a conceptual framework was defined containing five concepts. The remaining informative variables were grouped within these concepts. The variables of each group were all indicative of the same pre-specified concept. Then the variable which by logistic regression was the strongest indicator (difference in log-likelihood) of each concept controlling for age, gender, and calendar year was selected and a temporary model was built. The selected variables were then divided into a basic personal model including variables related to the victim and into a family model including variables related to the family. The variables in the two models were finally tested for interaction, and a final model including both personal and family related risk factors was constructed (Fig. 2). Two variables were used to describe unemployment. "Lifetime unemployment" refers to the summarized number of days the subject had been unemployed since the age of 16 years and until the age of 66. The number of unemployment days was divided by the number of years of life in the same period. The variable was divided into two categories of equal size. The category "unemployed" in the variable "socioeconomic group" refers to the employment status at the time of violence.

The final model was analysed in logistic regression models estimating odds ratios (ORs) with 95% confidence intervals (95% CI) using STATA 8™ (command: logistic). The ORs were estimated in a crude/unadjusted model, a semi-adjusted model, which was only adjusted for age, gen-
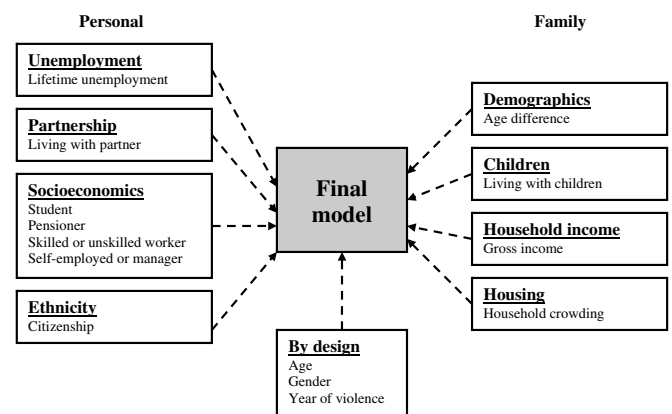
Fig. 2. The final model for analyses of demographic and socioeconomic risk factors of violent victimization.

der and year, and a fully adjusted model, which was adjusted for age, gender, year, and all other variables included in the final model. The same observations were included in all variables regardless of complexity. Due to the high number of cases and controls $p < 0.001$ was considered significant.

The study was approved by the Danish Data Protection Agency. As the study was a register-based study no approval from the Committee of Biomedical Research Ethics was required.

3. Results

All together, 72% of the cases and controls were males and 28% were females. The median age of the cases and controls was 31 years (range, 20–96 years). The median age of males and females were 29 years (range, 20–94 years) and 36 years (range, 20–96 years), respectively (Mann-Whitney, $p < 0.001$).

Overall, the size and direction of the odds ratios for the crude and the semi-adjusted analyses did not differ. Therefore, only the results of the semi-adjusted analyses will be reported.

In the semi-adjusted analyses of personal risk factors being a pensioner (OR: 11.44; 95% CI: 10.27–12.74), being unemployed (OR: 7.06; 95% CI: 6.45–7.73), living without a partner (OR: 3.24; 95% CI: 3.09–3.40), and a high level of lifetime unemployment (OR: 2.44; 95% CI: 2.33–2.55) were the factors most strongly positively associated with ED and/or IFM contact due to adult violent victimization (Table 1).

In the semi-adjusted analyses family factors strongly associated with ED and/or IFM contact due to adult violent victimization were annual household gross income less than €10,000 (OR: 6.93; 95% CI: 6.37–7.55), between €10,000 and €19,999 (OR: 5.19; 95% CI: 4.81–5.60), between €20,000 and €29,999 (OR: 1.98; 95% CI: 1.83–2.15), and living without children (OR: 1.96; 95% CI; 1.86–2.08) (Table 2).

In the multivariate logistic analyses of the fully adjusted model factors most strongly associated with ED and/or IFM contact due to adult violent victimization were being a pensioner (OR: 4.71; 95% CI: 4.18–5.30), being unemployed (OR: 3.15; 95% CI: 2.85–3.48), not living with a partner (OR: 2.93; 95% CI: 2.74–3.14), and annual household gross income of less than €10,000 (OR: 2.38; 95% CI: 2.16–2.63), whereas factors negatively associated with ED and/or IFM contact due to adult violent victimization were being a student (OR: 0.72; 95% CI: 0.63–0.83) and being a non-Danish, European citizen (OR: 0.84; 95% CI: 0.74–0.95) (Table 3).

In the semi-adjusted analysis foreign citizenship of a country outside Europe was significantly associated with ED and/or IFM contact due to adult violent victimization (OR: 1.79; 95% CI: 1.60–2.00). Adjusting for all other variables included in the multivariate analyses diminished the association to an insignificant level (OR: 1.08; 95% CI: 0.96–1.22).

The analysis of interactions in the final model revealed very few indications of significant interactions. Documentation regarding significant interactions and interaction analyses is available on request to the authors.

Table 1
The semi-adjusted analyses of personal risk factors for ED and/or IFM contact due to adult violent victimization: number of subjects, odds ratios (ORs), 95% CIs, and *p*-values

	Cases	Controls	Semi-adjusted analyses[a]	
	N = 10,799 (%)	*N* = 53,986 (%)	ORs (95% CI)	*p*-Values
Citizenship				
Danish	9872 (91.4)	50,323 (93.2)	1.00	
Other European	366 (3.4)	1719 (3.2)	1.09 (0.97–1.22)	0.155
Other World	447 (4.1)	1277 (2.4)	1.79 (1.60–2.00)	<0.001
No information	114 (1.1)	667 (1.2)	0.87 (0.71–1.07)	0.179
Partnership				
Living with partner	3191 (29.6)	29 238 (56.2)	1.00	
Not living with partner	7608 (70.4)	24 748 (45.8)	3.24 (3.09–3.40)	<0.001
Socioeconomic group				
Student	419 (3.9)	3767 (7.0)	1.43 (1.25–1.63)	<0.001
Pensioner	1822 (16.9)	3394 (6.3)	11.44 (10.27–12.74)	<0.001
Unemployed	3969 (36.8)	7875 (14.6)	7.06 (6.45–7.73)	<0.001
Skilled/unskilled worker	3899 (36.1)	29 468 (54.6)	1.80 (1.65–1.97)	<0.001
Self-employed/manager	630 (5.8)	9072 (16.8)	1.00	
No information	60 (0.6)	410 (0.8)	1.94 (1.46–2.57)	<0.001
Lifetime unemployment				
Less than half	3568 (33.0)	28,589 (52.9)	1.00	
More than half	7171 (66.4)	24,987 (46.3)	2.44 (2.33–2.55)	<0.001
No information	60 (0.6)	410 (0.8)	1.20 (0.91–1.58)	0.189

[a] Adjusted for age, gender, and year of violence.

Table 2
The semi-adjusted analyses of family related risk factors for ED and/or IFM contact due to adult violent victimization: number of subjects, odds ratios (ORs), 95% CIs, and *p*-values

	Cases	Controls	Semi-adjusted analyses[a]	
	N = 10,799 (%)	*N* = 53,986 (%)	ORs (95% CI)	*p*-Values
Age difference				
0–4 years	9511 (88.1)	46 407 (86.0)	1.00	
5 years or more	1288 (11.9)	7579 (14.0)	0.82 (0.77–0.88)	<0.001
Children				
Living with children	2332 (21.6)	17 082 (31.6)	1.00	
Not living with children	8407 (77.8)	36,494 (67.6)	1.96 (1.86–2.08)	<0.001
No information	60 (0.6)	410 (0.8)	1.24 (0.94–1.63)	0.133
Household gross income				
0–9999 € per year	3124 (28.9)	9335 (17.3)	6.93 (6.37–7.55)	<0.001
10,000–19,999 € per year	4606 (42.6)	15,571 (28.8)	5.19 (4.81–5.60)	<0.001
20,000–29,999 € per year	2046 (19.0)	15,799 (29.3)	1.98 (1.83–2.15)	<0.001
30,000 € per year ore more	963 (8.9)	12,871 (23.8)	1.00	
No information	60 (0.6)	410 (0.8)	2.69 (2.03–3.57)	<0.001
Household crowding				
0–24 m^2 per resident	1080 (10.0)	4203 (7.8)	1.13 (1.04–1.22)	0.003
25–49 m^2 per resident	3575 (33.1)	22,403 (41.5)	0.70 (0.66–0.74)	<0.001
50–74 m^2 per resident	2834 (26.2)	12,625 (23.4)	1.00 (0.94–1.06)	0.961
75 m^2 per resident or more	3108 (28.8)	13,970 (25.9)	1.00	
No information	202 (1.9)	785 (1.4)	1.15 (0.98–1.35)	0.088

[a] Adjusted for age, gender, and year of violence.

4. Discussion

The present study is the first major case-control study of demographic and socioeconomic risk factors of adult violent victimization leading to ED and/or IFM contact using population-based controls. The most important demographic and socioeconomic factors positively associated with ED and/or IFM contact due to violent victimization were being a pensioner, being unemployed, not living with a partner, and a low annual household gross income. Conversely, being a student was the most important factor negatively associated with violence. Citizenship was not positively associated with ED and/or IFM contact due to violent victimization when the analyses were adjusted for all included demographic and socioeconomic factors.

This study has a number of strengths. The first is the large prospective and consecutive sample of cases from the ED and/or the IFM, and the large sample of population-based controls. The Second is the Danish CPR-number which allowed separation of initial visits from follow-up visits. The third is using the CRS and the Danish CPR-number which enabled the selection of population-based controls and the merging of data across different registers. The fourth is our access to precise and reliable demographic and socioeconomic data about both cases and controls from different national longitudinal registers, and finally, in all included variables the proportions of missing values was less than 2%.

The victims of violence, as described in our study, include only those attending the ED and/or being subjected to medicolegal autopsy at the IFM. Because of possible selection bias the demographic and socioeconomic risk factors may not necessarily reflect the risk factors of all violence occurring in the municipality. We had no information available about the victims who seek medical attention at general practitioners', who are solely recorded by the police, or who are concealed to both the health care system and the police authorities. Especially the latter group may have social characteristics, which are significantly different from victims registered in the health care system. Additionally, the threshold which victims of violence have for attending the EDs may vary with the demographic, socioeconomic, and cultural backgrounds of the victims.[17,18]

Misclassification may also have biased our results. The inclusion of victims from the ED was solely based on interviews with the victims. Misclassification bias may arise as some victims may report non-violent traumas as the reason for attending the ED or vice versa. Unfortunately, we have no information about the extent and direction of such bias. Since all demographic and socioeconomic variables retrieved from national registers were not subject to recall errors or intentional misclassification, the degree of bias resulting from misclassification of these variables is likely to be very low.

The cases included in our study were "unselected" victims of violence from the ED and/or the IFM. Unfortunately, we had no valid information about the perpetrators. Therefore, we have not been able to analyse the data stratified into different typologies of violence e.g. domestic violence or community violence.

In the fully adjusted analyses of our study being a pensioner and being unemployed were the two most important risk factors. Conversely, being a student was the strongest factor negatively associated with adult violent victimization. In our study the term "pensioner" covers all kinds

Table 3
The multivariate fully adjusted logistic regression analyses of personal and family risk factors for ED and/or IFM contacts due to adult violent victimization: odds ratios (ORs), 95% CIs, and p-values

	Fully adjusted analyses[a]	
	ORs (95% CI)	p-Values
Citizenship		
Danish	1.00	
Other European	0.84 (0.74–0.95)	0.006
Other World	1.08 (0.96–1.22)	0.200
No information	0.62 (0.45–0.84)	0.002
Partner		
Living with partner	1.00	
Not living with partner	2.93 (2.74–3.14)	<0.001
Socioeconomic group		
Student	0.72 (0.63–0.83)	<0.001
Pensioner	4.71 (4.18–5.30)	<0.001
Unemployed	3.15 (2.85–3.48)	<0.001
Skilled/unskilled worker	1.41 (1.29–1.55)	<0.001
Self-employed/manager	1.00	
No information	3.09 (1.92–4.97)	<0.001
Lifetime unemployment		
Less than half	1.00	
More than half	1.92 (1.82–2.02)	<0.001
No information	3.09 (1.92–4.97)	<0.001
Age difference		
0–4 years	1.00	
5 years or more	1.56 (1.44–1.69)	<0.001
Children		
Living with children	1.00	
Not living with children	1.12 (1.05–1.21)	0.002
No information	1.80 (1.12–2.89)	0.015
Household gross income		
0–9999 € per year	2.38 (2.16–2.63)	<0.001
10,000–19,999 € per year	1.87 (1.71–2.04)	<0.001
20,000–29,999 € per year	1.34 (1.23–1.46)	<0.001
30,000 per year ore more	1.00	
No information	4.28 (2.65–6.96)	<0.001
Household Crowding		
0–24 m² per resident	1.86 (1.68–2.05)	<0.001
25–49 m² per resident	1.34 (1.25–1.43)	<0.001
50–74 m² per resident	1.18 (1.11–1.26)	<0.001
75 m² per resident or more	1.00	
No information	1.54 (1.24–1.91)	<0.001

[a] Adjusted for age, gender, year of violence, and all other variables included.

of retirement from the labour market including old age pension, disability pension, etc. The association between poor labour market affiliation and violent victimization is well known from other studies.[8,12,19–21] However, a previous British case-control study based on unselected ED contacts due to violence did not find any significant relation between unemployment or socioeconomic group and urban violence.[9] The small sample size and the fact that controls were selected among acquaintances of the victims may explain the results. In most previous ED studies victims with low socioeconomic status such as skilled or unskilled workers or students dominate.[3,22–24] Similarly, cross-sectional and case-control studies have also indicated the relation between low socioeconomic status such as being a pensioner or being unemployed and violent victimiza-

tion.[25–27] Most other studies have likewise shown that living alone or being single are important risk factors of violent victimization.[7,19,20,25,26,28–30] Low income has been related to an increased likelihood of violent victimization in a few other studies.[20,25] The association between household crowding or family size and violence has also been shown in a few previous studies of domestic violence.[26,31]

In the semi-adjusted analyses non-European citizenship was associated with an increased risk of violent victimization. However, the association vanished in the analyses of the fully adjusted model. Previous Danish and international studies have shown diverging associations between foreign citizenship or ethnicity and violent victimization.[3,25,29,32–35]

By defining a conceptual framework and by building a step-wise model for the analyses followed by a thorough testing of interactions it was possible to minimize the extent of interaction between the included variables. Future studies should include more factors such as alcohol consumption, mental illness, delinquent behaviour, and previous exposure to violence in the multivariate analyses.

In combination with results from similar studies the findings emphasize the multifaceted nature of injuries from violence. It is our conviction that this study points at a number of potential risk factors, which should be specifically addressed in the formulation of future preventive strategies. The precise role from the ED perspective is not clear, but obviously recurrence patterns and indicated social factors could point towards further possible interventions. The character, resource implications and tentative effects of interventions must be further scrutinized in research projects. There is however no doubt that a certain extend of obligation to assist the individual victims of violence regardless of social determinants rests on the personnel in the ED. The results of this and other studies emphasizes that there is a social gradient which is an important aspect when planning the implementation of such measures.

5. Conclusions

Our findings emphasize the multifaceted nature of injuries from deliberate interpersonal violence. Future studies should include additional factors such as psychological or psychiatric disorders, somatic health, and alcohol or drug abuse analysed in the models. We believe that findings from this study have indicated potential risk factors such as being a pensioner, low income, and unemployment, which should be specifically addressed when planning future preventive strategies. Conversely, citizenship seems to plays no role as a risk factor of violent victimization.

Conflict of interest

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